the optical disk apparatus further comprising:

connecting means for connecting the rotating apparatus and the moving apparatus with an electric source to supply an electric power to the rotating apparatus and the moving apparatus;

actuating means for actuating the compound objective lens of the optical head apparatus;

focus control means for controlling the actuating means to perform a first focus control of the optical head apparatus corresponding to the thickness T1 of the first information medium and a second focus control of the optical head apparatus corresponding to the thickness T2 of the second information medium according to the focus error signal read by the optical head apparatus;

tracking control means for controlling the actuating means to perform a first tracking control of the optical head apparatus corresponding to the thickness T1 of the first information medium and a second tracking control of the optical head apparatus corresponding to the thickness T2 of the second information medium according to the tracking error signal read by the optical head apparatus;

detecting means for detecting whether the optical disk has the first information medium having the thickness T1 or the second information medium having the thickness T2; and

changing means for switching from the second focus and tracking controls performed by the focus control means and the tracking control means

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to the first focus and tracking controls performed by the focus control means and the tracking control means according to the detection of the detecting means.

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92 (Amended). An optical disk apparatus according to claim 159, in which the optical head apparatus is configured, through the compound objective lens, to read an information signal, a focus error signal and a tracking error signal from the optical disk rotated by the rotating apparatus;

the optical disk apparatus further comprising:

connecting means for connecting the rotating apparatus and the moving apparatus with an electric source to supply an electric power to the rotating apparatus and the moving apparatus;

actuating means for actuating the compound objective lens of the optical head apparatus;

focus control means for controlling the actuating means to perform a first focus control of the optical head apparatus corresponding to the thickness T1 of the first information medium and a second focus control of the optical head apparatus corresponding to the thickness T2 of the second information medium according to the focus error signal read by the optical head apparatus; and

tracking control means for controlling the actuating means to perform a first tracking control of the optical head apparatus corresponding to the

thickness T1 of the first information medium and a second tracking control of the optical head apparatus corresponding to the thickness T2 of the second information medium according to the tracking error signal read by the optical head apparatus.

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93 (Amended). An optical disk apparatus according to claim 92 in which the compound objective lens of the optical head apparatus is moved in a direction to the optical disk by the moving apparatus, and the compound objective lens of the optical head apparatus is operated to focus the light beam on the first or second information medium by the actuating means under the control of the focus control means to decrease an intensity of the focus error signal to zero in case where the intensity of the focus error signal exceeds a threshold.

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113 (Amended). An optical head apparatus according to claim 156, comprising:

a photo detector for detecting the light beam, which is converged at an information recording plane, serving as the information plane, of the first information medium having the thickness T1 and at an information recording plane, serving as the information plane, of the second information medium having the thickness T2 by the compound objective lens and is reflected by the first information medium and the second information medium, respectively, to

obtain first information recorded in the information recording plane of the first information medium and second information recorded in the information recording plane of the second information medium.

115 (Amended). An optical disk apparatus according to claim 159, comprising:

a photo detector for detecting the light beam which is converged at an information recording plane, serving as the information plane, of the first information medium having the thickness T1 and at an information recording plane, serving as the information plane, of the second information plane having the thickness T2 by the compound objective lens and is reflected by the first information medium and the second information medium, respectively;

focus control means for performing a first focus control of the optical head apparatus corresponding to the thickness T1 of the and a second focus control of the optical head apparatus corresponding to the thickness T2 according to the light beam detected by the photo detector;

tracking control means for performing a first tracking control of the optical head apparatus corresponding to the thickness T1 and a second tracking control of the optical head apparatus corresponding to the thickness T2 according to the light beam detected by the photo detector; and

information detecting means for judging according to the light beam detected by the photo detector, for which the first focus control and the second

focus control and the first tracking control and the second tracking control are performed, whether the light beam radiated from the light source is converged at the information recording plane of the first information medium having the thickness T1 or at the information recording plane of the second information medium having the thickness T2, reproducing first information recorded in the information recording plane of the first information medium from the light beam detected by the photo detector in cases where it is judged that the light beam is converged at the information recording plane of the first information medium, and reproducing second information recorded in the information recording plane of the second information medium from the light beam detected by the photo detector in cases where it is judged that the light beam is converged at the information recording plane of the second information medium.

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122 (Amended). An optical disk apparatus according to claim 159,

in which the plurality of regions of the compound objective lens include:

a third region which corresponds to a numerical aperture NA3 satisfying a relationship of NA2≤NA3<NA1 and is unified with the first region of the objective lens through a discontinuous plane,

the optical head apparatus further comprising:

a photo detector for detecting the light beam which is converged at an information recording plane, serving as the information plane, of the first

information medium having the thickness T1 and at an information recording plane, serving as the information plane, of the second information medium having the thickness T2 by the compound objective lens and is reflected therefrom, respectively;

focus control means for performing a first focus control of the optical head apparatus corresponding to the thickness T1 and a second focus control of the optical head apparatus corresponding to the thickness T2 according to the light beam detected by the photo detector;

tracking control means for performing a first tracking control of the optical head apparatus corresponding to the thickness T1 and a second tracking control of the optical head apparatus corresponding to the thickness T2 according to the light beam detected by the photo detector; and

information detecting means for judging according to the light beam detected by the photo detector, for which the first focus control and the second focus control and the first tracking control and the second tracking control are performed, whether the light beam radiated from the optical source is converged at the information recording plane of the first or second information medium having either of the thickness T1 or T2, reproducing first information recorded in the information recording plane of the first information medium having the thickness T1 from the light beam detected by the photo detector in cases where it is judged that the light beam is converged at the information recording plane of the first information medium, and reproducing second

information recorded in the information recording plane of the second information medium having the thickness T2 from the light beam detected by the photo detector in cases where it is judged that the light beam is converged at the information recording plane of the second information medium.

123 (Amended). An optical head apparatus according to claim 156, in which the compound objective lens comprises

an optical device for minimizing an aberration occurring in the light beam in cases where the light beam passing through the optical device transmits through the first layer of the first information medium having the thickness T1 and is focused on an information recording plane, serving as the information plane, of the first information medium, and

a ring-shaped band, placed on at least one surface of the optical device, for shifting a phase of the light beam passing through the optical device to reduce a wavefront aberration caused by a difference between the thicknesses T1 and T2 of the first and second information media in cases where the light beam passing through the optical device transmits through the second layer of the second information medium having the thickness T2 and is focused on an information recording plane, serving as the information plane, of the second information medium;

the optical head apparatus further comprising

a photo detector for detecting the light beam which is converged on the information recording plane of the first information medium having the thickness T1 and on the information recording plane of the second information medium having the thickness T2 by the compound objective lens and is reflected by the first information medium and second information medium to reproduce information recorded in the first and second information media, respectively.

126 (Amended). An optical head apparatus according to claim 156, in which the compound objective lens comprises

a phase adjusting device, formed in a ring-band shape, for shifting a part of the light beam radiated from the optical source,

the compound objective lens having a light converging performance so as to converge the light beam radiated from the optical source on an information recording plane, serving as the information plane, of the first information medium having the thickness T1 through the layer thereof at a diffraction limit, to converge the light beam, of which the part is shifted by the phase adjusting device, on an information recording plane, serving as the information plane, of the second information medium having the thickness T2 or the information recording plane of the first information medium having the thickness T1 through the layer thereof,

the optical head apparatus further comprises

a photo detector for detecting the light beam, which is converged on the information recording plane of the first and second information media each having the thickness T1 or T2 by the compound objective lens and is reflected by the first and second information media, respectively, to reproduce information recorded in the first and second information media, respectively.

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128 (Amended). An optical disk apparatus according to claim 159, in which the optical head apparatus comprises

an optical device for minimizing an aberration occurring in the light beam in cases where the light beam passing through the optical device transmits through the layer of the first information medium having the thickness T1 and is focused on an information recording plane, serving as the information plane, of the first information medium,

a ring-shaped band, placed on at least one surface of the optical device, for shifting a phase of the light beam passing through the optical device to reduce a wavefront aberration caused by a difference between the thicknesses T1 and T2 of the first and second information media in cases where the light beam passing through the optical device transmits through the layer of the second information medium having the thickness T2 and is focused on the information recording plane thereof, and

a photo detector for detecting the light beam, which is converged on the information recording planes of the first and second information media having

the thicknesses T1 and T2 by the compound objective lens and is reflected by the first and second information media, respectively, to reproduce information recorded in the first and second information media, respectively;

focus control means for performing a first focus control of the optical head apparatus corresponding to the thickness T1 of the first information medium and a second focus control of the optical head apparatus corresponding to the thickness T2 of the second information medium according to the light beam detected by the photo detector;

tracking control mans for performing a first tracking control of the optical head apparatus corresponding to the thickness T1 and a second tracking control of the optical head apparatus corresponding to the thickness T2 according to the light beam detected by the photo detector; and

information detecting means for judging according to the light beam detected by the photo detector, for which the first focus control and the second focus control and the first tracking control and the second tracking control are performed, whether the light beam radiated from the optical source is converged at an information recording plane, serving as the information plane, of the first or second information medium having the thickness T1 or T2, reproducing first information recorded in the information recording plane of the first information medium having the thickness T1 from the light beam detected by the photo detector in cases where it is judged that the light beam is converged at the information recording plane of the first information medium,

and reproducing second information recorded in the information recording plane of the second information medium having the thickness T2 from the light beam detected by the photo detector in cases where it is judged that the light beam is converged at the information recording plane of the second information medium.

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131 (Amended). An optical head apparatus according to claim 156, in which the plurality of regions of the compound objective lens include

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a third region, corresponding to a numerical aperture NA4 equal to or lower than the numerical aperture NA2 (NA4≤NA2), for changing the light beam radiated from the optical source to converge the light beam on an information recording plane, serving as the information plane, of the second information medium having the thickness T2 through the layer thereof; and

a photo detector for detecting the beam light, which is converged on the information recording plane of the first information medium having the thickness T1 and on an information recording plane, serving as the information plane, of the second information medium having the thickness T2 by the compound objective lens and is reflected by the first and second information media having the thickness T1 and T2, respectively, to reproduce first information recorded in the first information medium and second information recorded in the second information medium, respectively.

132 (Amended). An optical disk apparatus according to claim 159, in which the plurality of regions of the compound objective lens include

a third region, corresponding to a numerical aperture NA4 equal to or lower than the numerical aperture NA2 (NA4≤NA2), for changing the light beam radiated from the optical source to converge the light beam on an information recording plane, serving as the information plane, of the second information medium having the thickness T2 through the layer thereof;

a photo detector for detecting the light beam, which is converged on the information recording plane of the first and second information media each having the thickness T1 or T2 by the compound objective lens and is reflected by the first and second information media, respectively, to reproduce information recorded in the first and second information media, respectively;

focus control means for performing a first focus control of the optical head apparatus corresponding to the thickness T1 of the first information medium and a second focus control of the optical head apparatus corresponding to the thickness T2 of the second information medium according to the light beam detected by the photo detector;

tracking control means for performing a first tacking control of the optical head apparatus corresponding to the thickness T1 of the first information medium and a second tracking control of the optical head apparatus corresponding to the thickness T2 of the second information medium according to the light beam detected by the photo detector; and

information detecting means for judging according to the light beam detected by the photo detector, for which the first focus control and the second focus control and the first tracking control and the second tracking control are performed, whether the light beam radiated from the optical source is converged at an information recording plane, serving as the information plane, of the first information medium having the thickness T1 or at an information recording plane, serving as the information plane, of the second information medium having the thickness T2, reproducing first information recorded in the information recording plane of the first information medium from the light beam detected by the photo detector in cases where it is judged that the light beam is converged at the information recording plane of the first information medium, and reproducing second information recorded in the information recording plane of the second information medium from the light beam detected by the photo detector in cases where it is judged that the light beam is converged at the information recording plane of the second information medium.

133 (New). A compound objective lens, comprising a region to produce a focal point on an information plane through a layer, wherein the region of the lens is divided into a plurality of regions including at least both of a first region and a second region by dividing the region of the lens depending on differences in a distance from an optical axis of the lens,

the first region being located farther from the optical axis than a position of the second region,

the second region being optimized so that the lens has a numerical aperture NA2 to produce a focal point through a second layer on an information plane placed at a distance T2 from the surface of the second layer, and

both of the first region and the second region being optimized so that the lens has a numerical aperture NA1 (NA1 is not equal to NA2) to produce a focal point through a first layer on an information plane placed at a distance T1 (T1 is not equal to T2) from the surface of the first layer.

134 (New). A compound objective lens according to claim 133, wherein the second region has an optical relief,

the numerical aperture NA1 is larger than the numerical aperture NA2, and

the distance T1 is smaller than the distance T2.

135 (New). A compound objective lens according to claim 134, in which the optical relief is formed concentrically in the second region of the compound objective lens.

136 (New). A compound objective lens according to claim 134, in which the optical relief is provided on a side of the compound objective lens opposite to the optical disk.

137 (New). A compound objective lens according to claim 134, in which the first region has an optical relief formed therein.

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138 (New). A compound objective lens according to claim 137, in which the optical relief of the first region is higher in height than the optical relief of the second region.

139 (New). A compound objective lens according to claim 134, comprising an objective lens on which the plurality of regions are provided.

140 (New). A compound objective lens according to claim 134, comprising an objective lens and a relief lens on which the plurality of regions are provided.

141 (New). A compound objective lens according to claim 134, in which the distance T1 is larger than 0.4 millimeter and smaller than 0.8 millimeter.

142 (New). A compound objective lens according to claim 134, in which the optical relief of the second region is a hologram.

143 (New). A compound objective lens according to claim 142, in which the hologram of the second region has a diffraction efficiency lower than 100%.

144 (New). A compound objective lens according to claim 142, in which the hologram of the second region is formed to function as a convex lens.

145 (New). A compound objective lens according to claim 142, in which the hologram of the second region has slopes inclining to the same direction as a surface of a convex lens.

146 (New). A compound objective lens according to claim 142, in which the plurality of regions include at least one region having no optical hologram.

147 (New). A compound objective lens according to claim 146, in which the first region has no hologram.

148 (New). A compound objective lens according to claim 142, in which the first region has a hologram.

149 (New). A compound objective lens according to claim 148, in which the first region is higher in a diffraction efficiency than the second region.

150 (New). A compound objective lens according to claim 134, in which a height H of the optical relief formed in the second region is set to:

$H<\lambda/(n(\lambda)-1)$,

where a symbol λ denotes a wavelength of a light beam passing through the second region and a symbol $n(\lambda)$ denotes a refractive index of a material of the optical relief at the wavelength λ of the light beam.

151 (New). A compound objective lens according to claim 150, in which a difference in phase modulation degree of the light beam passing through the second region is lower than 2π radian.

152 (New). A compound objective lens according to claim 142, in which the hologram of the second region is formed into a blazed hologram lens.

153 (New). A compound objective lens according to claim 152, in which the hologram is formed into saw-teeth in a section thereof.

154 (New). An optical head apparatus for performing at least one of recording and reproduction of pieces of information on and from an optical disk placed to face the optical head apparatus, comprising

(i) an optical source for radiating a light beam; and

(ii) a compound objective lens receiving the light beam and comprising a region to produce a focal point on an information plane through a layer, wherein

the region of the lens is divided into a plurality of regions including at least both of a first region and a second region by dividing the region of the lens depending on differences in a distance from an optical axis of the lens,

the first region being located farther from the optical axis than a position of the second region,

the second region being optimized so that the lens has a numerical aperture NA2 to produce a focal point through a second layer on an information plane placed at a distance T2 from the surface of the second layer, and

both of the first region and the second region being optimized so that the lens has a numerical aperture NA1 (NA1 is not equal to NA2) to produce a focal point through a first layer on an information plane placed at a distance T1 (T1 is not equal to T2) from the surface of the first layer.

155 (New). An optical head apparatus according to claim 154, comprising:

a collimate lens to change the light beam from the optical source into an approximately parallel light; and

an optical detector to receive light from both of the information planes placed at a distance T1 from the surface of the first layer and placed at a distance T2 from the surface of the second layer, wherein

the compound objective lens receives the approximately parallel light.

156 (New). An optical head apparatus according to claim 154, wherein the numerical aperture NA1 is larger than the numerical aperture NA2 (NA1>NA2) and

the distances T1 and T2 correspond to thicknesses T1 and T2 of the first and second layers composed of, respectively, first and second information media included in the optical disk, the thickness T1 being smaller the thickness T2 (T1<T2).

157 (New). An optical disk apparatus, comprising

(1) an optical head apparatus for performing at least one of recording and reproduction of pieces of information on and from an optical disk placed to face the optical head apparatus, comprising

(i) an optical source for radiating a light beam; and

(ii) a compound objective lens receiving the light beam and comprising a region to produce a focal point on an information plane through a layer, wherein

the region of the lens is divided into a plurality of regions including at least both of a first region and a second region by dividing the region of the lens depending on differences in a distance from an optical axis of the lens,

the first region being located farther from the optical axis than a position of the second region,

the second region being optimized so that the lens has a numerical aperture NA2 to produce a focal point through a second layer on an information plane placed at a distance T2 from the surface of the second layer, and

both of the first region and the second region being optimized so that the lens has a numerical aperture NA1 (NA1 is not equal to NA2) to produce a focal point through a first layer on an information plane placed at a distance T1 (T1 is not equal to T2) from the surface of the first layer;

(2) a moving apparatus for moving the optical head apparatus; and

(3) a rotating apparatus for rotating the optical disk.

158 (New). An optical disk apparatus according to claim 157, comprising: a focus controller to change a distance between the optical disk

and the compound objective lens and start focus control when a focus error signal detected from the compound objective lens surpasses a predetermined level so as to perform focus control corresponding to the different distances T1 and T2.

159 (New). An optical disk apparatus according to claim 157, wherein the numerical aperture NA1 is larger than the numerical aperture NA2 (NA1>NA2) and

the distances T1 and T2 correspond to thicknesses T1 and T2 of the first and second layers composed of, respectively, first and second information media included in the optical disk, the thickness T1 being smaller the thickness T2 (T1<T2).